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Thèse portant sur les effets de la fréquentation d'une classe de maternelle sur le vocabulaire des enfants. Le but de cette étude est de déterminer si les enfants de cinq ans qui fréquentent la maternelle manifestent plus de changement au niveau du quotient intellectuel, tel que mesuré par le "Peabody picture vocabulary test" (1959), que ceux qui ne fréquentent pas une telle classe. La recherche porte sur des enfants de statut socio-économique et socio-culturel varié.

L'étude porte sur des enfants de deux groupes ethniques différents, soit 54 Américains d'Ithaca et de sa banlieue (Etat de New-York) ainsi que 116 Québécois francophones de Chicoutimi; ces derniers incluaient un groupe de contrôle de 57 enfants ne fréquentant pas la maternelle et résidant à Ste-Claire, près de Chicoutimi. L'âge moyen des enfants était de 64,8 mois; trois sous-groupes ont été établis en fonction du statut socio-économique (élevé, moyen ou faible). L'étude a été menée durant l'année scolaire 1965-1966.

On peut conclure de cette recherche que les enfants qui ont fréquenté la maternelle manifestent un accroissement de quotient intellectuel supérieur aux autres; elle démontre de plus que la maternelle profite plus à cet égard aux enfants de niveau socio-économique peu élevé, qui entrent en classe avec un quotient intellectuel plus faible. Au point de vue du vocabulaire, les progrès dus à la maternelle sont évidents chez eux qui l'ont fréquentée et il n'y a pas de différence à cet égard entre Québécois et Américains.

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A STUDY OF THE EFFECTS OF KINDERGARTEN EXPERIENCE ON VOCABULARY

A Thesis

Presented to the Faculty of the Graduate School

of Cornell University for the Degree of

Doctor of Philosophy

by

Sister Candide Pinoault

June, 1967

TO ALL THE FIVE-YEAR-OLDS

ESPECIALLY THOSE WHO HELPED ME

IN THIS STUDY

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INTRODUCTION

Words are the symbols of ideas, and to express and communicate ideas, one needs facility in using them. We can even go far as to say that words are the measure of a man. In the foreword of "The Ruling Passion", Henry Van Dyke prays: "Help me to deal very honestly with words and with people because they are both alive". Impressive is Binet's statement (5), that he can analyse a person's character from twenty words that he has written. Bruner tells us (12) that we think with words; in fact, an important part of analytical thinking - categorizing - is done almost intuitively by the words we choose.

Of the human characteristics by which one person is judged by others, vocabulary occupies a position among the foremost. During routine daily contacts, both in social and occupational spheres, our vocabulary is in constant use in the communication of ideas, in the expression of feeling and emotion, in making our wants known, and in plying our respective professions and trades. To a skilled observer, a man's vocabulary can yield much information about himself - his vocational pursuits, the geographical area from which he comes, and his cultural level, to name but a few. Individuals are characterized by the quantity and quality of the words they use, just as they are by their physical attributes, manner of dress, and habit patterns in general. In such characterization, vocabulary is perhaps a more valid and stable index, since it is started at an early age, develops with time, and thus becomes a more or less automatic function which is not readily changed at will.

Teachers are continuously stressing the size of a child's vocabulary. This practice shows up in spelling lists, in the use of vocabulary controlled basic readers, in mental aptitude tests, and in standardized reading tests. The test of intellectual capacity is in part a vocabulary test. Rightly or wrongly, a child is said to have greater mental ability, if he is familiar with many different words.

Today, as they have in the past, vocabulary tests occupy prominent places in various batteries of tests designed to measure general intelligence. Tyler declares that "vocabulary is an excellent indicator of general intelligence in children, as it correlates highly with most other types of intellectual activity. If a single test must be given to a child in order to ascertain the mental level at which he is functioning, a vocabulary test is more satisfactory than any other" (50:32). An enthusiastic advocate of the use of vocabulary tests is Armstrong, who speaks of the Stanford-Binet vocabulary test as a divining-rod of intellect particularly sensitive to intelligence and individual differences... (1:272). Regarding his 1916 Revision of the Binet tests, Terman contends that the vocabulary test has a higher value by far than any other single test of the scale. A similar contention is made with reference to the 1937 Revision: "We have found the vocabulary test to be the most valuable single test in the scale. Its interest value is high, it presents a familiar task to the subject, and the fact that it begins with words in common use and increases rapidly in difficulty gives the examiner a rapid survey method of estimating the subject's ability" (49:302). Wechsler also considers the size of a man's vocabulary to be an excellent measure of his general intelligence, the vocabulary test is desirable because of its qualitative possibilities (53). According to Dunn, numerous studies investigating the

measurement of intelligence have shown that vocabulary is the best single item for predicting school success (18:32).

The foundations of vocabulary development are laid in the home during preschool years. Concepts of self, of others, and of the infinite and finite worlds have their roots in early childhood, and these concepts are closely interwoven with family speech patterns and usage. Since language is primarily a response to a social situation, and as such is intended to convey meaning to some other persons, the presence of other people in the environment would seem to have an influence upon the quantity and maturity of language activity.

The school builds on the foundation made in the home and ideally cultivates an interest in vocabulary development that will continue throughout life, for this is a learning activity that does not cease with completion of formal education.

The nursery school and kindergarten have traditionally stressed the importance of language learning for the preschool child. The content of his speech is significant not only in relation to his growth in language and to his interests, but also as a measure of his personality development. As Breckenridge and Murphy put it, "speech is indeed the mirror of personality" (10). The preschool child needs a broad background of language experience to help clarify concepts and to build an adequate speaking vocabulary. He needs to feel comfortable in conversational situations with children his own age and with adults.

Language development is an important aspect of the kindergarten program and permeates all phases of it. It takes place in such activities as the sharing time, story or poetry reading, planning together, dramatic play, and small group discussions. Even casual conversations during play-

time are valuable, particularly for the child whose language development is limited in vocabulary and concepts. Such a youngster learns from children whose language development is more advanced.

How much difference does preschool experience make in the development of the children's intellectual abilities? Research has shown a clear relationship between early childhood experience and formal learning. The results of investigations have suggested that children with kindergarten experience tend to make relatively more rapid progress in the first five grades than children who have not attended kindergarten, and that they tend to receive higher teacher ratings on oral language, as well as such traits as industry and initiative. If this is the case, then preschool education should not be reserved for a group of privileged children. It should be open to all families which desire to take advantage of this service, whatever their social background. In most industrialized countries, the system of nursery schools and kindergartens is very extensive. In France, the minimum age of admission is as low as two, the maximum being six; in 1958, 63% of all children three, four, and five years old attended a nursery school or kindergarten. The preschool attendance rate is almost as high in England and the Union of Soviet Socialist Republics (U.S.S.R.). In the United States, the kindergarten serves more than half the younger children. In Ontario, Canada, 1650 public and separate schools have at least one preschool class.

The Ministry of Education of the Province of Quebec, Canada, has undertaken to organize a preschool education service. Since preschool education is not general in the province, especially in the Roman Catholic sector, the Act providing grants for school commissions, approved by the provincial legislature in 1961, sought to encourage the establishment of

kindergartens. As the Royal Commission's report said:

> All school commissions are to consider themselves as much responsible for preschool education as for elementary and secondary education, since the introduction of the kindergarten in the public school is expected to assure all children, regardless of family circumstances, a preparation which they need before beginning regular elementary studies... Nursery schools and kindergartens should become a public service, like elementary and secondary education. They should be free and accessible to all children, and, for even more compelling reasons, to those in poor neighborhoods as much as to those from prosperous families (43:81).

Our province has a great deal to do to make up for lost time in preschool education, and to place it at the disposal of everyone. During the school year 1965-1966, 760 kindergartens, each on double session, provided classes for a total of 31,000 French-Canadian five-year-olds from the province of Quebec, (that is 22% of all five-year-olds in Quebec).

The primary purpose of the present study is to investigate one aspect of the kindergarten child namely, his vocabulary. Specifically, the data will be in reference to the relationship between vocabulary, as measured by a standardized test, the Peabody Picture Vocabulary Test (PPVT), and variables such as sex, age, socioeconomic status, father's and mother's education, family size, and birth order. An additional aim is the attempt to determine whether the raw scores and IQ gains on the PPVT are due to the child's rapid growth and maturation, or if they are related to the kindergarten year of experience. This explains the presence of the control group among Canadian children, and justifies the cross-cultural character of this study.

Several facets of the research and findings reported in this thesis had, until now, not been treated of sufficiently: 1) the present work incorporates a treatment of five-year-old children of different socio-

economic status and parents' education backgrounds, 2) it is on a cross-cultural basis, and 3) the testing was by means of the PPVT. This combination of variables, it will be made clear below, are original to this work.

CHAPTER I

RESEARCH DESIGN AND PROCEDURES

Of all the stages of children, possibly the most challenging is that of the primary years. Educators and psychologists agree that these preschool years represent the period of most rapid progress in both expressing language and understanding language. How much difference does preschool experience make in the development of children's intellectual abilities? It seems reasonable to suppose that if schooling makes a difference, the earlier its impact, the greater would be its total effect on intellectual development. The influence of kindergarten training on the later development of the child has been a research problem since the beginning of the century, when kindergartens were becoming increasingly widespread in Western culture.

Statement of the Problem

The purpose of this study is to determine whether five-year-old children who attend kindergarten show significantly greater changes in IQ, as measured by the Peabody Picture Vocabulary Test (1959), than those not attending such a school. It explores the possible effect of kindergarten experience on the IQ by determining whether, with groups of kindergarten and non kindergarten children, there is evidence to substantiate the hypothesis that kindergarten training increases the IQ.

Assumptions

It is assumed that:

1. the PPVT[1] is a valid and reliable instrument in the measurement of the child's hearing vocabulary;
2. a cross-cultural study involving American and French-Canadian five-year-old children would create a ground for comparison between the two cultures.

Limitation

This problem will concern only vocabulary as measured by the PPVT. Consequently, all the work of the period before the child actually uses words, all the discussion on the theories of the origin of language, and all theories dealing with pronunciation and the pathology of speech of children will be omitted.

The age period studied is limited to five, the range used being 60 to 71 months.

Hypotheses

The author undertook to test the following hypotheses:

1. the kindergarten groups, disregarding social class, will have a higher mean IQ gain than the non-kindergarten group;
2. when social class is taken into consideration, the low s.e.s.[2] kindergarten groups' mean IQ gain will be higher than the high s.e.s. kindergarten groups';

---

1 This abbreviation stands for Peabody Picture Vocabulary Test and will be used for the rest of the study.

2 This abbreviation stands for socioeconomic status and will be used hereafter.

3. the American and the French-Canadian high s.e.s. kindergarten groups' IQ gains will not be different;
4. the low s.e.s. kindergarten groups' IQ gain will be higher than the low s.e.s. non kindergarten group's gain;
5. the low s.e.s. non kindergarteners will show a loss of IQ points instead of a gain;
6. there will be a high positive correlation between the size of the family and the children's IQ gains;
7. there will be no correlation between birth order and IQ gain.

The period of time over which the gains will occur is a school year, namely 10 months.

Variables

In this study, hearing vocabulary, i.e. comprehension of the spoken word, the ability to associate verbal symbols with pictorial representations of objects, events, and actions, the dependent variable, has been examined in relation to the following independent variables:

1. sex;
2. age in months: 60 to 71 months;
3. nationality: American and French-Canadian children;
4. father's and mother's education: years of schooling;
5. socioeconomic status: children from high, middle and low socioeconomic level. This has been measured in terms of Blishen's "Occupational Class Scale" which takes into account income and years of schooling;
6. family size (number of children);
7. birth order.

These last two variables (6 and 7) have been considered even though little research was available to confirm their influence on the child's vocabulary.

On the matter of sex differences in language development, comparison of various groups of males and females on diverse tests, has made it fairly clear that girls and women do not have larger vocabularies than do boys and men. In the study by W.W. Clark (1959), girls and boys at three levels, (3, 5, and 8) made similar scores on the Reading Vocabulary test. Bennet, et al. (1956) reported very little difference between the sexes on either the verbal or the numerical aptitude scores of the Differential Aptitude Test battery designed for high school students. Dunsdon and Fraser-Roberts (1957) gave four oral vocabulary tests from leading intelligence scales to 2,000 English children, a 3 per cent random sample of all the children from 5 to 15 in Bristol. At all ages, the boy's norms averaged about one word higher than the girls'. In most of the comparisons that have been made on vocabulary, the sex groups have turned out not to differ significantly.

There is abundant evidence that the socioeconomic status of children is associated with their intelligence, but little agreement as to the interpretation of this association. Determination of the effect of socioeconomic status on vocabulary was the purpose of the study conducted by Cuff (14), who reports a positive relationship between social status and vocabulary, although this relationship is admittedly slight in view of the low positive correlations (.30, .29, .32) obtained between social status and five, ten, and fifteen-minute vocabulary tests.

Since family patterns of behavior vary to a considerable extent with socioeconomic status we can easily account for the findings of

Templin (48) and others that language development is faster in the upper socioeconomic levels. The studies of Noel (40), Smith (44, 45, 46), Strickland (47), Loban (29) and others confirm the fact that most children beginning school have already learned to use whatever sound system, grammar and vocabulary are characteristic of their home and neighborhood.

The Sample

The children used in this study came from two different ethnic groups. There were 54 American five-year-olds from Ithaca and suburbs, New York, United States, (36,000 pop.), and 116 French-Canadian five-year-olds from Chicoutimi, province of Quebec, Canada, (31,651 pop.).

The 54 American children were kindergarteners and were attending three different public schools: 18 from Cayuga Heights School, 20 from South Hill School, and 16 from Henry St. John School. The French-Canadian children considered as the experimental group (59) were kindergarteners in two different schools in Chicoutimi: 32 at Riviere-du-Moulin School, and 27 at St-Isidore School. The control group composed of 57 non kindergarteners were chosen in Ste-Claire, a suburb of Chicoutimi, where no kindergarten classes were available.[1]

The three groups were equated for age and socioeconomic status. The following tabulation, which shows the degree to which equating was accomplished on these factors reveals differences between the groups, but seemingly not of significant amount.

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1 There being public kindergarten facilities available to all children in the Ithaca area, there was no way to provide a control group.

TABLE I

DISTRIBUTION OF AGE AND SOCIOECONOMIC LEVELS FOR THREE GROUPS

TRAITS	AGE, MONTHS			S. E. S.		
	Range	Mean	S.D.	Range	Mean	S.D.
AMERICAN N=54	60-70	64.5	3.5	38.9-72.0	53.1	12.2
FR. CAN. EXP. N=59	60-71	65.8	2.9	37.5-69.8	49.2	6.6
FR. CAN. CONT. N=57	60-68	64.1	2.4	37.4-72.0	48.0	6.1

The age range of the subjects was from 60 to 71 months, with a mean chronological age of 64.8 months, and a standard deviation of 2.9.

Socioeconomic status was scored according to Blishen's "Occupational Class Scale" which classifies occupations according to a variety of characteristics including income and years of schooling. Blishen (7) divided 343 occupations into 7 classes and scored them from a high 90.0 to a low 32.0. In order to classify the testees in high, middle or low s.e.s. the writer sent a questionnaire (see Appendix) to the parents asking them to describe the father's occupation. In all cases studied (N=170), the father was present in the family and considered the wage-earner. Ratings ranging from 90.0 to 50.0 were designated high, those ranging from 49.9 to 45.1, middle, and those as low as 45.0 to 32.0 were definitely classified in the low class.

On the basis of this scoring three subgroups were established: high, middle and low socioeconomic status. The following table presents this subdivision which will be referred to hereafter.

TABLE II

SOCIOECONOMIC DIVISION FOR THE THREE GROUPS

	RANGE			MEAN		
s.e.s.	High	Middle	Low	High	Middle	Low
AMERICAN N=54	57.7-82.5	45.6-49.9	38.9-44.6	68.8	49.3	41.6
FR. CAN. EXP. N=59	50.1-69.8	45.5-49.6	37.5-44.4	56.5	47.2	43.2
FR. CAN. CONT. N=57	50.2-72.0	44.6-48.2	37.4-44.2	55.5	46.4	43.0

Although no attempt was made to choose subjects to provide a balance as to sex, it happens that a ratio of almost one to one appeared, as shown in TABLE III.

TABLE III

DISTRIBUTION OF SEX WITHIN THE THREE GROUPS

s.e.s.	High			Middle			Low		
SEX	M	F	Total	M	F	Total	M	F	Total
AMERICAN N=54	11	7	18	11	9	20	10	6	16
FR. CAN. EXP. N=59	10	11	21	10	9	19	11	8	19
FR. CAN. CONT. N=57	5	13	18	8	10	18	9	12	21

Additional information on father's education, mother's education, family size and birth order complete the picture of the 170 five-year-olds used in this study. A detailed table presenting the distribution of birth

order is not necessary in this sample description. It will be used later in the analysis.

The years of education are interestingly correlated with the socio-economic status of the parents. This occurs most markedly for the fathers, but similarly for the mothers, as shown below in TABLES IV and V respectively.

The education of the parents ranges from 4 to 22 years of schooling. The mean for the fathers being 14.8 years, and for the mothers, 11.4. A detailed analysis of these tables is not in order here. Note simply that there is a high positive correlation of years of education to socioeconomic status, both for the American and for the Canadian groups. For the American, we find: r=0.90. For the Canadians, on the same trend, we find: r=0.64 and 0.66. In the section on Findings and Discussion, these results will be correlated with the gains made by children in the respective groups.

TABLE IV

Distribution of the Father's Education for Three Groups

S.E.S.	High							Middle							Low							
Years of School	3-6	7-10	11-14	15-18	19-22	RANGE	MEAN	3-6	7-10	11-14	15-18	19-22	RANGE	MEAN	3-6	7-10	11-14	15-18	19-22	RANGE	MEAN	TOTAL
AMERICAN N=54	0	0	10	4	11	14-22	20.8	0	1	15	4	0	10-16	12.7	0	5	11	0	0	7-14	11.4	54
FR. CAN. EXP. N=59	0	3	4	2	2	7-22	17.1	2	8	9	0	0	4-14	9.7	5	13	1	0	0	4-11	7.5	59
FR. CA. CONT. N=57	1	5	6	3	0	6-18	11.3	3	13	2	0	0	5-14	8.9	3	16	2	0	0	5-12	8.1	57
TOTAL	1	17	14	9	10			5	22	26	4	0			8	34	14	0	0			170

TABLE V

Distribution of the Mother's Education for Three Groups

S.E.S.	High							Middle							Low							
Years of School	3-6	7-10	11-14	15-18	19-22	RANGE	MEAN	3-6	7-10	11-14	15-18	19-22	RANGE	MEAN	3-6	7-10	11-14	15-18	19-22	RANGE	MEAN	TOTAL
AMERICAN N=54	0	0	6	11	1	12-22	15.3	0	0	20	0	0	10-16	12.0	1	2	13	0	0	7-14	11.5	54
FR. CAN. EXP. N=59	2	11	7	1	0	4-15	9.5	2	13	4	0	0	6-14	8.9	4	13	2	0	0	6-13	7.8	59
FR. CAN. CONT. N=57	1	9	8	0	0	6-14	9.5	4	11	3	0	0	6-13	8.2	3	10	6	2	0	6-15	9.5	57
TOTAL	3	20	21	12	1			6	24	27	0	0			8	25	21	2	0			170

TABLE VI

NUMBER OF CHILDREN IN THE FAMILY FOR THE THREE GROUPS

s.e.s.	High		Middle		Low	
	RANGE	MEAN	RANGE	MEAN	RANGE	MEAN
AMERICAN N=54	2-6	3.6	1-5	3.1	1-9	3.5
FR. CAN. EXP. N=59	1-9	5.0	2-12	5.3	2-12	6.5
FR. CAN. CONT. N=57	1-15	5.8	1-10	5.4	1-13	5.7

TABLE VI suggests that, unlike years of education and the socio-economic status, the number of children per family does not correlate significantly with the socioeconomic status. Rather, the correlation is of number of children with nationality, the Canadian families tending, as a rule, to be larger than their American counterparts.

The Instrument

Description

The study and measurement of the young child's vocabulary is necessarily confined principally to the oral vocabulary. Pictoral representations of objects, events, and actions proved to be the best way to examine the dependent variable of this research, namely the five-year-old's hearing vocabulary. It is for this reason that the Peabody Picture Vocabulary Test (PPVT) has been used.

Developed by Lloyd Dunn at the George Peabody College for Teachers, Nashville, Tennessee, in 1959, the PPVT is designed to provide an estimate of a subject's verbal intelligence through measuring his hearing vocabulary.

It was standardized on random samples of 4,012 subjects of all levels of intellect extending over the age range 2 years 6 months through 18 years. It purports to measure comprehension of spoken words, including the ability to associate verbal symbols with pictorial representations of objects, events and actions; it measures intelligence as a function of acquired verbal ability.

The test consists of 150 plates arranged in ascending order of difficulty of identification. Each plate contains four pictures: three decoys and a correct one. Categories of plates include: man-made objects, animals, birds, human actions (gerunds), nature scenes, plants, flowers, adverbs, adjectives, musical instruments, occupations, scientific materials, parts of a house, and wearing apparel.

The PPVT is administered by having the child indicate which picture on the plate best illustrates the meaning of the orally presented stimulus word. No oral verbal response is required. The subject is tested from a basal of eight consecutive correct responses to a ceiling of six errors out of eight responses.

Two equivalent forms, A and B, being available, the author used Form B because some words on Form B could be more accurately translated into French. The same set of plates is used for both forms of the test.

Reliability

Dunn obtained reliability coefficients for the PPVT by calculating Pearson product moment correlations on the raw scores of the standardization subjects for Forms A and B at each level. Standard errors of measurement for standard scores (I.Q.'s) were then calculated from the parallel forms reliability coefficient. Correlations ranged from a low of 0.67 at the six year level to a high of 0.84 at the 17 and 18 year

levels, with a median of 0.77. The standard errors of measurement for I.Q. scores ranged from 6.00 to 8.61, the median being 7.20 (18:30).

Validity

Validity data for the PPVT were obtained both for individual items and for the total test.

Content validity was built into the test when a complete search was made of Webster's New Collegiate Dictionary (G and C Merriam, 1953) for all words whose meanings could be depicted by a picture. An initial pool of 3,885 words was selected. Approximately half of these words were illustrated for the initial series of plates, and tried out. The best 300 words of the 600 studied at the pre-testing stage were retained (18:32).

Item validity was established by selecting individual words where the per cent of subjects passing increased from one age group to the next. Only items demonstrating linear, steep growth curves were retained. Words were avoided which were biased culturally, regionally, and racially.

Congruent validity was also established. PPVT mental age scores have correlated with 1937 Binet mental age scores over the range 0.60 to 0.87 with a median of 0.71. With the 1960 Binet mental age correlations have ranged from 0.82 to 0.86 with a median of 0.83. PPVT I.Q.'s have correlated with 1937 Binet I.Q.'s over the range 0.43 to 0.92 with a median of 0.71.

PPVT I.Q.'s correlated with the Wechsler Intelligence Scale for Children - F (WISC-F) over the range 0.30 to 0.84 with a median of 0.61; with the WISC-V over the range 0.41 to 0.74 with a median of 0.67; with the WISC-P over the range of 0.19 to 0.82 with a median of 0.39. In general, PPVT I.Q.'s correlate more closely with Wechsler than Binet I.Q.'s (18:33).

Some information concerning concurrent validity is available involving the "Sequential Tests of Educational Progress" (STEP), "California Achievement Tests" (CAT), "Wide Range Achievement Test" (WRAT), "Stanford Achievement Tests" (SAT), "Metropolitan Achievement Tests" (MAT), "The Gray-Votaw-Rogers Achievement Tests", and teacher ratings of school achievement. The validity coefficients range from a low of 0.04 in the Kimbrell (1960) study (Gray-Votaw-Rogers Achievement Test) to a high of 0.91 in the Dunn and Harley (1959) study (Ammons, Van Alstyne, and Columbia Test of Mental Maturity). The next lowest after 0.04 was 0.32 in the Wolfensberger (1962) study (Wide Range Achievement Test). The coefficients ranged as follows: 2 in the 0.30's (WRAT), 7 in the 0.40's (WRAT, CAT), 7 in the 0.50's (STEP, CAT, WRAT), 7 in the 0.60's (CAT, STEP, SAT), 1 in the 0.70's (SAT), 2 in the 0.80's (teacher ratings, Columbia Test of Mental Maturity), and 2 in the 0.90's (Ammons, Van Alstyne). The median correlation value tends to fall in the 0.50's. Binet correlations with such tests tend to run 0.15 points higher than for the PPVT, and Wechsler scores 0.10 points higher.

Predictive validity or the extent to which PPVT scores "predict" school achievement scores obtained some time after the PPVT is given was established. Using first grade children, Klaus and Starke (1964) found PPVT raw scores obtained at the beginning of the school year to correlate with MAT word knowledge scores 0.30, word discrimination 0.35, and reading taken at the end of the school year, 0.39. With educable retardates, Moss (1962) found a correlation of 0.22 with MAT reading scores and 0.43 with MAT arithmetic scores. The author of the PPVT test acknowledges that while positive, these values are low.

Translation

The cross-cultural character of this study necessitated the translation of the PPVT into French. With a team of two French-Canadian linguistic professors of a French-Canadian College in Quebec, the author undertook a careful examination of the drawings, and the corresponding test key words. None of the pictorial representations was found to be nonexistent in, nor non pertaining to, the French-Canadian culture. There is, for instance, an American coin, but the Canadian children are used to it and the "eagle representation" on the piece did not hamper their recognition of the concept "monnaie".

Following the picture examination and evaluation, the author translated the test into French. The translation was examined and approved by a linguistic specialist at Cornell University. Some difficulty with accuracy arose concerning establishing an equivalent for the English gerund, but this was solved by use of the French infinitive, for example: climbing-grimper. This proved to work out without problem during the testing of the French-Canadian subjects.

Administration

The PPVT is not timed and does not require special skills for administration. The author gave the test to all subjects. In this way uniformity was preserved in the accumulation of data, and the usual variations of IQ due to a variety of examiners was avoided. It was administered individually and a quiet room away from others was provided in each situation. The time used by each testee ranged from 10 to 20 minutes.

The character of this research necessitated two testing periods. The first testing was done at the beginning of the kindergarten year in

September and early October 1965. The second took place at the end of the school year in June 1966. Form B of the PPVT was used each time.

Definition of the Terms Used

Experimental group : The five-year-old children who were registered at a regular kindergarten and attended it for the school year 1965-1966.

Control group : The five-year-old children who neither registered for nor attended a regular kindergarten.

French-Canadians : Children residing in Chicoutimi, province of Quebec, Canada, and for whom French is the native language.*

Americans : Children residing in Ithaca, New York, U.S.A., and for whom English is the native language.

Hearing vocabulary : As defined by Dunn, the PPVT's author: "Comprehension of the spoken word. The ability to associate verbal symbols with pictorial representations of objects, events, and actions" (18).

Socioeconomic status : Social class in which the family fits according to a variety of characteristics including income and years of schooling as measured by Blishen's "Occupational Class Scale" (7).

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* The abbreviations F.E.C. and F.C.C. standing for French-Canadian Experimental and French-Canadian Control will be used for the rest of the study.

CHAPTER II

REVIEW OF LITERATURE

The fact that the term vocabulary covers many different types of achievement has become generally accepted by researchers. The following distinctions have been made: 1) oral, reading, and written vocabulary; 2) recognition and recall; 3) "meaning" i.e. a psychological as opposed to "formal" or dictionary analysis of elements; and 4) use versus verbal definition. Williams (55, 56, 57) has proposed a distinction between extent (number of different symbols), and power or depth (explicitness and richness of meaning). Larrick suggested (28) the following methods for estimating the size of a child's vocabulary: 1) counting different words used in a natural oral-language situation, 2) counting different words used in a written-language situation, 3) counting different words in a free-association situation, 4) counting different words used in stimulus-response situation, and 5) estimating vocabulary from words recognized on a selected list.

A review of relevant literature shows that attempts to measure segments and estimate totals of children's vocabularies have been numerous during the last 75 years, and that vocabulary growth depends upon a complex of factors. An extensive search of the field revealed the following principal hypotheses: 1) vocabulary is related to socioeconomic status and home environment, and 2) instruction by means of school attendance and social interaction can increase vocabulary.

Relationship of Vocabulary to Socioeconomic Status and Home Environment

Among listed factors which affect children's vocabularies, socioeconomic status often occupies first place. Previous research has shown that subjects from high socioeconomic status groups develop language more rapidly, and to a greater degree of competency, than subjects of low socioeconomic status. Socioeconomic status has been shown to stand in a positive relation to language, and the extent to which a child utilizes his linguistic abilities and potential is influenced by his home environment (31). According to Loban (29) the home environment has a noticeable effect upon the child's learning of conventional pronunciation, standard use, and distinct speech. McCarthy (31, 32, 33) gives evidence supporting the thesis that the quality of a child's early linguistic environment is the most important external factor affecting the rate of language development. Templin (48) affirms that language development is faster in the upper socioeconomic levels.

It has been found consistently that groups of children whose fathers are in the upper occupational levels have a higher mean IQ than groups of children whose fathers are in the lower occupational levels. Neff (39) reports that, in general, children of the lowest urban social group (unskilled common laborers) average about 20 points lower than the children from the professional classes.

As early as 1935, Cuff (14) reported that experimental studies led to the following conclusions: 1) There is a cyclical relationship between the periods of rapid increase in vocabulary and the widening of the child's experience; 2) children of the upper class are about eight months ahead of children of the proletariat in language development; 3) children

of well-to-do and educated families exceed those of the poor both in the precocity with which they interpret words and in the exactness reached in the proportion of 2:1; 4) environmental factors correlate consistently higher with the results of vocabulary tests than with intelligence test results.

In 1964, Wayson administered the Peabody Picture Vocabulary Test to kindergarten children in two schools in Syracuse New York, serving culturally deprived children, and compared them with the results of the same test administered to kindergarteners in upper middle-class school. Wayson's findings "clearly support the hypothesis that the children from the lower-status homes begin their school careers with a great lingual handicap" (52).

Today's researchers who have used sub-cultural comparisons in their studies of language development have become widely known. Irwin (1948a, 1948b), Templin (1957), D.R. Thomas (1962), Loban (1963), Lesser, Fifer, and Clark (1965), various members of the Institute for Developmental Studies - e.g. Deutsch (1963), John (1963), Deutsch and B. Brown (1964), John and Goldstein (1964), Cherry (1965) -- all divided their subjects only by social class in their treatments of three chosen aspects of language development: phonology, vocabulary, and sentence structure (today more often termed *grammar*). Cazden (13) concludes that all these studies' findings can be quickly summarized thus: "On all the measures, in all the studies, children of upper socioeconomic status, however defined, are more advanced than those of lower socioeconomic status".

Effects of Preschool Attendance on Vocabulary

Animal experiments have demonstrated that early experiences affect later development, while on the human level, preschools have produced some improvement in the intelligence level of orphanage children whose previous environment has been usually sterile, though they seem to have had little effect on the mental development of children from culturally richer homes. However, scholars and professionals involved in the field of child development (e.g. Hess) have had a remarkably difficult time demonstrating that the pre-school years form a critical stage in human development.

Research attempting to measure changes in IQ due to nursery-school attendance was common during the period 1925 to 1940. Two types of comparisons were used: 1) changes in the same children during periods of attendance and non-attendance, and 2) comparative changes in matched experimental and control groups, in which the experimental children did, and the control groups did not, attend nursery school.

The major contributions to date on this problem have been the publications from the Iowa Child Welfare Research Station, which claimed substantial increases in test scores through nursery-school experience. Briefly, the conclusions of these studies are: 1) the average IQ of children tested after experience in a nursery-school is higher than the average IQ achieved before that experience; 2) there is an increase in IQ on successive tests during nursery-school education; that is, nursery-school experience has a cumulative effect; 3) IQ increases are permanent. Generally, however, critics have challenged these results because of a number of deficiencies in statistical design and analyses. The most frequent mistakes have been the lack of an adequate control group and

the failure to separate the effects of maturation from the effects of nursery-school.

The effects of nursery-school attendance have been studied by Barrett and Koch, Kawin and Hoefer, Bird, Goodenough and Maurer, Lamson, and Olson and Hugues. In 1930, Barrett and Koch (2) worked with two orphanage groups matched as to sex, age, initial score on Merrill-Palmer test, and length of institutional experience. They retested the children after an interval of 6 to 9 months. During this period, 17 children, who constituted the experimental group, attended nursery-school. The mean initial IQ's were 91.7 and 92.6. The experimental group gained 20.9 points in IQ; the control group, 5.1 points. Therefore, these data support the hypothesis that nursery-school experiences tend to increase children's IQ's.

In Kawin and Hoefer's study (26), the nursery-school group did not show greater growth associated with their nursery-school experience. Twenty-two children attending nursery-school and twenty-two children not attending, were matched according to age, mental age on the Merrill-Palmer scale, and sex. These authors discovered that after 6.8 months, the nursery-school group had gained 11.4 months in mental age; the control group, 11.5 months. Percentile rank changes were 24.6 and 26.0 respectively.

Lamson's study (27) compared children in kindergarten, first and second grades, who had spent two years in a nursery-school, with children of their respective grades who had not had nursery-school experiences. This research led Lamson to conclude that nursery-school experiences neither increase nor decrease intelligence quotients. Neither do such experiences affect height, weight, or reading achievement, nor increase social

development over that of non-nursery-school children. Bird (6), Goodenough and Maurer (23), and Olson and Hugues (41) agreed with Lamson that nursery-school attendance did not increase the IQ.

On the other hand, a small, statistically non-significant, difference between nursery-school and non-nursery-school children is reported by Frandsen and Barlow (19). In their study a group of 30 children, aged 2 to 5 years, were tested with the Stanford-Binet intelligence test at the beginning of a term in the nursery-school training. A control group of 28 children, with whom they were equated approximately with respect to age, socioeconomic status, and extent of home training, was examined at about the same time. As a result of the special nursery-school environment, the experimental group gained 3.34 IQ points, as compared with a gain of 0.53 point for the control group. The gain for the experimental group, although it approximates statistical significance, appears very small when compared with the whole range of individual differences in IQ resulting from both hereditary and environmental causes. Over a longer period, and perhaps with a different nursery-environment, increases might be large enough to affect significantly the preschool children's learning abilities or capacities for adjustment.

A few studies seem to indicate that kindergarten does pay off in first grade. Research from the 1930's shows the value of kindergarten at that time in terms of later successes in formal school work. A higher percentage of children attending kindergarten made normal or accelerated progress through the elementary grades than children entering first grade without experience. However, the problem of matching groups of children with and without kindergarten made reliable data difficult to obtain.

In 1943, McHugh (34) investigated fluctuations in measured intelligence at school entry. He tested 91 children on the 1937 Revised Stanford-Binet within three months before and again within three months after they entered kindergarten. The general finding here is of a statistically significant increase in test scores in this interval. Score changes were unrelated to length of kindergarten attendance before the second test, to social maturity as measured by the Vineland Social Maturity Scale, and to socioeconomic and educational status of the parents. There were, however, indications that the major gains were made within the first month after kindergarten entry, and suggestions of a relationship between gain in IQ and reduction in shyness and negativism. McHugh concluded, therefore, that the score changes represented adjustmental gains rather than growth in intelligence.

Bergamini, Yolanda, and Swanson (1954) compared kindergarten trained and non-kindergarten trained children at first grade level. They concluded that kindergarten children had higher scores in number work, copying and language usage; lower scores in word-meaning and comprehension of language (4).

In 1957, Irene Fast, (20) of the University of Michigan, made use of an existing situation in which age, home background and school environment of the children could be controlled. She analyzed the scores of 134 first graders who had had a year of kindergarten work, and 46 comparable pupils who had not had such training on a test of reading readiness given one month after first grade began, as well as reading achievement tests administered at the middle and end of the first year. Consistent with previous research findings, children with kindergarten training were found to obtain significantly higher scores on all reading tests than

children without such training.

Meyers (1963) studied the grades and ratings of 44 children who had attended kindergarten and 44 who had not. He made no attempt to equate groups for intelligence, age, home backgrounds, physical conditions. His grade comparisons were made in reading, numbers, spelling, writing, music, language, and social science. He also compared ratings on social attitudes and health habits, play and games behavior, work and study habits, and ability to get along with others. Meyers found that the kindergarten children did greater progress in content subjects and in the ability to adjust to school conditions (35).

Fox and Powell (1964) equated 115 first graders who had attended kindergarten with 179 who had not, on the California Test of Mental Maturity, and administered the Lee-Clark Readiness Test to the same children. No significant differences were found at the first or second grade level. Thus, these findings do not substantiate the hypothesis that kindergarten experiences develop readiness and promote greater achievement in the primary grades (21).

Borum and Livson, (1965) from the University of California's Institute of Human Development in Berkeley, also compared two groups: kindergarteners and non-kindergarteners. Their study reports that "girls showed increased intelligence test scores attributable to kindergarten entrance, and also, a tendency for amount of improvement to be positively related to parents' education. Boys for whom mean gains were nonsignificant, tended to improve more the younger their age of entry. Length of experience in kindergarten prior to the post-entry test was unrelated to size of gain in either sex" (9).

The term "compensatory education" (which is a stimulus for the intellectual growth of children) has been used very frequently, especially since the birth of the Head Start Program in the United States. An enthusiastic promoter of this theory, Martin Deutsch, director of the Institute for Developmental Studies, speaks about it thus:

> The whole concept of the possibility of training to ameliorate deficits which underlie cognitive and learning abilities is based on the assumption that the environment plays a crucial role in development; that it is through the child's experience that much development is stimulated; and that appropriate stimulation is essential for development of the functions mentioned (17:9).

Recent investigators such as Kagan at the Fels Research Institute, and Bloom (8) and Hess at the University of Chicago, have launched promising projects related to the education of the disadvantaged pre-school children. Cazden has a careful and informative summary of these University of Chicago researchers' findings to date (1966).

> This is a particularly important study because it relates intra-individual and inter-individual modes of communication. It has been planned as a test of the Bernstein hypothesis of a relation between the child's cognitive development and the mother's verbal ability, maternal teaching style, and characteristic mode of family control. In all, 160 Negro mothers from four socio-economic levels were interviewed, tested, and brought to the university for a structured session of mother-child interaction. Each mother was taught three tasks --two sorting tasks and the use of an Etch-a-Sketch board -- and then asked to teach those tasks to her four-year-old-child. Her maternal teaching style was monitored and analyzed. The children were subsequently tested by being asked to sort new material and give a verbal explanation. Preliminary results indicate that, while there were no social-class differences in affective elements of the interaction or in persistence of the mothers or in cooperation of the children, on at least some of the performance measures social-class differences were in the direction expected (13:212).

Hess and Shipman (1965a, p. 192) have reported:

> Children from middle-class homes ranked above children from the lower socioeconomic levels in performance on these sorting tasks, particularly in offering verbal explanations as to the basis of sorting. These differences clearly paralleled the relative abilities and teaching skills of the mothers from the different groups.

In the same article, Cazden speaks of the work of another researcher, Stodolsky (1965): One year after the original data had been collected, she administered the Peabody Picture Vocabulary Test and Kohlberg's Concept Sorting Test to 56 of the original 160 children from three of the four socioeconomic groups. The children's scores were then correlated with a selected set of maternal variables from the previous year to find the best predictors.

> She found that there were significant social-class differences in the vocabulary scores of the children, and that a set of maternal variables predicted those scores with a multiple correlation of .68. The best single pair of maternal variables, in this respect, proved to be the mother's score on the vocabulary part of the W.A.I.S. and one of the indices of teaching style. The latter was the "discrimination index" that measures the extent to which the mother isolates task-specific qualities of the environment. While scores on the W.A.I.S. differentiated among the mothers on social-class lines, scores on the discrimination index did not. In other words, there is an interaction between characteristics that are class-linked and those that are not (13:213).

A similar project, undertaken by Michigan researchers, with Weikart as director, is called "Perry Preschool Project" (1964). The purpose of this experiment is to assess the longitudinal effects of a two-year preschool program designed to compensate for mental retardation which is associated with cultural deprivation. The program, designed for culturally deprived Negro children diagnosed as mentally retarded, consists of

a cognitively oriented morning preschool and afternoon home visits to involve mothers in the educative progress. Findings at this time are tentative; they have not been substantiated by replication nor by the time it takes for a measure of academic success and school adjustment. To quote the project's director: "The criteria of the effectiveness of preschool to compensate for cultural deprivation are academic success and school adjustment, not immediate change on individual intelligence tests... (and that) it is this "across-the-board" strength that gives substance to the belief that preschool offers much hope for ameliorating the learning problems of a majority of the functionally retarded, culturally deprived, Negro children" (54:61).

The effects of preschool learning environments are being studied by investigators such as: Martin Deutsch in New York, Bettye Caldwell in Syracuse, Susan Gray in Nashville, and Smilansky in Israel. These studies and their findings will add significantly to our knowledge about the effects of early experience in humans by developing methods for instruction and socialization in the next decade.

Studies related to childhood education may be divided in two groups -- those who suggest that the IQ is increased by nursery-school and kindergarten attendance, and those who do not. Most of the recent research on the value of preschool education has been devoted to studying the effects and/or value of kindergarten education. Weight of evidence seems slightly to favor kindergarten experience with regard to achievement in first grade, and to first-grade teachers' opinions of physical, social and emotional adjustment and readiness for learning.

Critics have mentioned some shortcomings of these research studies: the lack of careful design and statistical controls; a tendency toward fragmentation which offers too little information about the child as a whole or about early childhood education philosophy and methodology in general; lack of acknowledgement of the relative extent and influence of maturation and growth as related to early childhood education programs; lack of control groups in the majority of the studies.

CHAPTER III

FINDINGS AND DISCUSSION

How much difference does kindergarten experience make in the development of the five-year-old's vocabulary? The primary purpose of the present study is an attempt to answer this question.

In order to determine this experimentally, 170 five-year-old children, of whom 113 were kindergarteners (experimental groups), and 57 were non-kindergarteners (control group), were selected. These children represented upper, middle and lower socioeconomic levels, as measured by Blishen's "Occupational Scale". Two cultures were compared, the American and the French-Canadian. The author also attempted to find out what, if any, relationships held between vocabulary, as measured by a standardized test (the PPVT), and variables of sex, age, socioeconomic status, father's and mother's education, number of children, and birth order.

First Testing Results

Form B of the PPVT was administered to the 170 subjects in September and early October 1965. The following table shows the first test results expressed in mean IQ points and raw scores.

TABLE VII

MEAN IQ'S AND RAW SCORES FOR THREE GROUPS ON THE PPVT: FIRST TEST

GROUPS	HIGH S.E.S.		MIDDLE S.E.S.		LOW S.E.S.	
	IQ	RS	IQ	RS	IQ	RS
AMERICAN N=54	114.4	58.7	104.1	54.7	102.4	53.0
F.C.E. N=59	117.6	61.2	114.9	60.9	102.3	53.6
F.C.C. N=57	109.9	55.6	106.2	54.7	104.5	53.5
MEAN	113.9	58.5	108.4	56.7	103.1	53.3

Consistent with previous research findings, and especially with recent intensive studies of deprived children in the United States, (3, 17, 54), subjects of the lower class scored lower than those of the middle and upper classes. A mean IQ of 103.1 for the three low class groups, as opposed to mean IQ of 108.4 and 113.9 for middle and high classes respectively, testify to this.

The mean mental age in months, and the mean percentile results for the first test, for the three groups are as follows:

TABLE VIII

MEAN MENTAL AGE IN MONTHS AND MEAN PERCENTILE RESULTS
WITH STANDARD DEVIATIONS
FOR THE THREE GROUPS: FIRST TEST

GROUPS	HIGH S.E.S.			MIDDLE S.E.S.			LOW S.E.S.		
	M.A.	S.D.	%ile S.D.	M.A.	S.D.	%ile S.D.	M.A.	S.D.	%ile S.D.
AMERICAN N=54	80.0	11.3	81. 15.2	71.5	12.7	59. 28.3	69.6	12.7	54. 28.9
F. C. E. N=59	85.7	18.4	79. 29.0	85.3	18.5	75. 30.3	70.2	17.6	52. 37.0
F. C. C. N=57	74.7	17.6	71. 27.7	72.5	20.3	59. 33.7	71.3	18.2	63. 35.5

The 113 kindergarteners who composed the two experimental groups attended kindergarten during the school year 1965-1966. In both cases, the school year lasted 10 months, during which period the children were exposed to various school activities for two and a half hours daily, five days a week. The control group, 57 non-kindergarteners, did not receive any school instruction; due to the inaccessibility of kindergarten facilities, they remained at home.

This kindergarten experience was the constant to which the two experimental groups were exposed. Neither the richness of the school curriculum and environment, nor the quality of the teachers was studied or appraised. Similarly, there was no in-depth study of the home environment (parental influence, neighborhood, etc.) of the children in the

control groups. Thus, the results of these tests have as partial bases variables that were neither measured nor treated in this study.

Second Testing Results

The same form of PPVT was administered to the same subjects, for a second time, in June 1966. A school term of 10 months, separated the two tests, thus the factor of practice in taking the test twice may be considered insignificant.

The mean raw scores and IQ's for each of the nine sub-groups, for the second test follow:

TABLE IX

MEAN IQ'S AND RAW SCORES FOR THREE GROUPS ON THE PPVT: SECOND TEST

GROUPS	HIGH S.E.S.		MIDDLE S.E.S.		LOW S.E.S.	
	IQ	RS	IQ	RS	IQ	RS
AMERICAN N=54	122.5	65.2	118.0	63.6	121.8	65.4
F.C.E. N=59	125.0	68.0	125.8	69.3	118.5	64.5
F.C.C. N=57	119.9	64.5	114.0	61.8	110.0	59.8
MEAN	122.4	65.9	119.2	64.9	116.8	63.2

Table X presents the picture of the mean mental age in months and mean percentile results for the three groups for the second test.

TABLE X

MEAN MENTAL AGE IN MONTHS AND MEAN PERCENTILE RESULTS
WITH STANDARD DEVIATIONS
FOR THE THREE GROUPS: SECOND TEST

GROUPS	HIGH S.E.S.				MIDDLE S.E.S.				LOW S.E.S.			
	M.A.	S.D.	%ile	S.D.	M.A.	S.D.	%ile	S.D.	M.A.	S.D.	%ile	S.D.
AMERICAN N=54	95.1	5.0	93.	3.7	90.5	10.9	86.	12.5	94.4	9.1	90.	14.3
F.C.E. N=59	100.2	8.0	92.	7.4	103.4	11.1	90.	9.0	92.4	11.9	84.	15.3
F.C.C. N=57	92.6	13.4	85.	21.5	86.6	13.6	79.	23.7	82.6	15.2	75.	27.0

Observed Intelligence Quotient Changes

When the IQ's of the first test are compared with those of the second test, a change in either the positive (gain) or the negative (loss) direction is noticed. Only 12 cases out of 170 (.07 per cent) remained unchanged, (3 Americans, 5 F.C.E., 4 F.C.C.).

TABLE XI gives the direction and frequency of IQ changes for each of the three groups divided according to s.e.s. levels. The tabulation shows that the majority of IQ gains for both experimental and control groups is 15 points or less, and that the maximal increase and decrease are respectively 26 and 5 points. The table also indicates that while 131 children gained IQ points, 27 lost IQ points, and 12 remained unchanged.

TABLE XI

DIRECTION AND FREQUENCY OF IQ CHANGES

S.E.S.	Groups	GAIN						LOSS				UN-CHANGED	TOTAL
		1-5	6-10	11-15	16-20	21-25	26	1-5	6-10	11-15	16-20		
HIGH	American N=18	2	3	4	4	0	0	2	0	0	0	3	18
	F.C.E. N=20	4	3	2	0	1	3	3	1	0	1	3	21
	F.C.C. N=16	2	4	3	1	1	2	2	1		0	2	18
MIDDLE	American N=21	4	2	6	4	2	2	0	0	0	0	0	20
	F.C.E. N=19	2	4	3	1	2	2	4	0	0	0	1	19
	F.C.C. N=19	5	2	5	3	0	0	1	1	1	0	0	18
LOW	American N=18	1	2	2	4	4	3	0	0	0	0	0	16
	P.C.E. N=18	5	1	1	1	0	7	3	0	0	0	1	19
	P.C.C. N=21	3	4	2	0	0	3	2	4	1	0	2	21
	Total	28	25	28	18	10	22	17	7	2	1	12	170

It is of primary interest to compare the IQ gains made by each of these groups for the three s.e.s. classifications. One way to compare the gains is to compare the mean gains in each case. These comparisons are shown in the table below.

TABLE XII

MEAN IQ GAINS FOR THE NINE SUB-GROUPS

GROUPS	HIGH	MIDDLE	LOW
American	8.1	13.9	13.4
French-Canadian Exp.	7.3	10.9	16.0
French-Canadian Cont.	10.1	7.8	5.5

IQ Change and Original IQ

Those study data suggest that an inverse relationship exists between initial IQ levels and IQ gains. An investigation of the correlation shows that the correlation between initial IQ gain is -0.70. TABLE XIII which follows presents the details of this inverse relationship giving the original score in intervals, the corresponding number of IQ changes, and the average change for each of the three groups.

TABLE XIII

ORIGINAL I.Q. AND I.Q. CHANGE

ORIGINAL SCORE	NUMBER			AVERAGE CHANGE		
	AMER.	F.C.E.	F.C.C.	AMER.	F.C.E.	F.C.C.
79 and below	1	3	5	37.0	40.3	31.0
80 to 89	44	9	3	18.5	27.4	7.6
90 to 99	10	7	12	21.2	27.4	9.5
100 to 109	16	5	11	15.6	5.2	6.7
110 to 119	16	7	11	8.1	- 0.14	3.3
120 to 129	5	22	13	3.6	7.8	1.7
130 and over	0	6	2	0.	- 1.0	- 6.5
	54	59	57			

Because of the strong inverse relationship between IQ gains and initial IQ shown above, the differences between average IQ gains shown in TABLE XII could be contaminated by the effects of initial IQ. In order to eliminate the effects of initial IQ on IQ gains, the populations whose gains are to be compared, were paired with respect to initial score. The following populations were compared with respect to IQ gains:

1. F.C.E. high s.e.s. with F.C.C. high s.e.s.
2. F.C.E. middle s.e.s. with F.C.C. middle s.e.s.
3. F.C.E. low s.e.s. with F.C.C. low s.e.s.
4. American high s.e.s. with F.C.E. high s.e.s.
5. American middle s.e.s. with F.C.E. middle s.e.s.
6. American low s.e.s. with F.C.E. low s.e.s.

For each of the six comparisons the hypothesis tested was that $\mu_1 = \mu_2$ (i.e., that the two populations means are equal). The test used was the t-test with N-1 degrees of freedom, when N pairs were observed. (See Appendix C for details).

The first comparison made was between the F.C.E. high s.e.s. and F.C.C. high s.e.s. There were 14 pairs observed for this comparison. The t-statistic obtained was .101 which is not statistically significant at any reasonable level of significance. Thus, there seems to be no difference in IQ gains between these two populations.

Next, the populations F.C.E. middle s.e.s. and F.C.C. middle s.e.s. were compared. There were 14 pairs observed in this case. The t-statistic obtained was 1.58 which is significant at the .10 level of significance for one-sided test. Therefore, the children of middle s.e.s. who go to kindergarten probably have a higher average IQ gain than those who do not go to kindergarten.

The third comparison dealt with F.C.E. low s.e.s., and the F.C.C. comparable group. Sixteen pairs were observed. A t-statistic of 2.24 was obtained, which is significant at the .025 level of significance. Since the t-value is significant at this low level, the hypothesis that the French-Canadian kindergarteners obtain a higher mean IQ gain than do the French-Canadian non-kindergarteners of low s.e.s. is supported.

The next three comparisons concern the American and the French-Canadian Experimental groups. When the high and middle s.e.s. American groups were paired with the high and middle s.e.s. F.E.C. groups, 12 pairs were obtained for each comparison. The t-statistics obtained were -0.25 in the first case, and -0.28 in the second case, which are not statistically significant at any reasonable level of significance. Thus, there seems to be no difference in IQ gains among these 4 populations.

The last comparison made was between the American low s.e.s. and F.C.E. low s.e.s. There were 13 pairs observed for this comparison. The t-statistic obtained was 1.36 which is just significant only at the .20 level of significance. This indicates that the American low s.e.s. kindergarteners might have a higher average IQ gain than the F.C.E. low s.e.s.

Here follows a summary of the 6 comparisons made, and their t values:

TABLE XIV

THE RESULTS OF THE TESTS:
THE T VALUES AND THEIR SIGNIFICANCE LEVELS
FOR EACH OF THE COMPARISONS

COMPARISONS	HIGH S.E.S.	MIDDLE S.E.S.	LOW S.E.S.
F.C.E. vs F.C.C.	t= .101 not significant	t= 1.59 sign. at .10	t= 2.24 sign. at .025
AMER. vs F.C.E.	t= -0.25 not significant	t=-0.28 not significant	t= 1.36 sign. at .20

Pairings have eliminated some bias due to the effect of initial IQ's. This can be seen in TABLE XV.

TABLE XV

MEAN INITIAL IQ SCORES AND MEAN IQ GAINS FOR EACH COMPARISON MADE BEFORE AND AFTER PAIRING

COMPARISONS	HIGH S. E. S.				MIDDLE S. E. S.				LOW S. E. S.			
	BEFORE		AFTER		BEFORE		AFTER		BEFORE		AFTER	
	Initial IQ	IQ Gain	Initial IQ	IQ Gain	Initial IQ	IQ Gain	Initial IQ	IQ Gain	Initial IQ	IQ Gain	Initial IQ	IQ Gain
F.C.E.	117.6	7.3	114.9	8.6	114.9	10.9	109.4	12.2	102.5	16.0	105.6	12.8
vs												
F.C.C.	109.9	10.1	114.3	8.2	106.2	7.8	109.3	5.7	104.5	5.5	105.8	5.0
AMERICAN	114.4	8.1	115.0	7.3	104.1	13.9	105.3	13.5	102.4	19.4	102.3	18.6
vs												
F.C.E.	117.6	7.3	115.1	8.1	114.9	10.9	105.3	14.6	102.5	16.0	101.8	12.7

First, on inspection of data in TABLE XV it is evident that for each comparison made, the mean initial IQ's are approximately equal after pairing. The most significant change occured for the comparison of F.C.E. and F.C.C. high s.e.s. In the case, before pairing was done, the difference in mean scores for high s.e.s. F.C.E. and high s.e.s. F.C.C. was 2.8 which may be a significant difference. However, after the effects of initial scores were eliminated by pairing observations, the difference in the mean was only .4 as shown in TABLE XV. Other corrections of this type are indicated in the same table. Thus, it is evident that pairing eliminated some bias due to the effects of initial IQ's on IQ gain.

A Nonparametric Test Applied to These Data

The use of the t-test requires the assumption that the d_i's (i.e. the differences in IQ gains for the pairs) are normally distributed. Though this assumption is certainly not met exactly, it is hoped that it holds approximately, and that the results given previously are valid. As a partial check of the results, the same comparisons will be made using a nonparametric test, namely the signed rank test. This test does not require any assumption about the distribution of the d_i's except that they are distributed symmetrically. In this situation, the assumption of symmetry is certainly more feasible than that of normality. The results of these tests are given in the table below. This table should be compared with TABLE XIV.

TABLE XVI

SIGNIFICANCE LEVELS FOR EACH COMPARISON
USING THE SIGNED RANK TEST

COMPARISONS	HIGH S.E.S.	MIDDLE S.E.S.	LOW S.E.S.
F.C.E. - F.C.C.	not significant	signif. at about the .21 level	significant at .02[illegible] level
AMERICAN - F.C.E.	not significant	not significant	signific[illegible] at .21[illegible] level

This table compares favorably with TABLE XIV, especially if it is realized that if the assumption of normality is valid, then the t-test is more powerful than the signed rank test. Thus, under the assumption of normality, it would be expected that the levels at which the test statistics are just significant would be lower for the t-test than for the signed rank test. This order relation does in fact hold in this situation. Therefore, it seems as though the t-test results are valid.

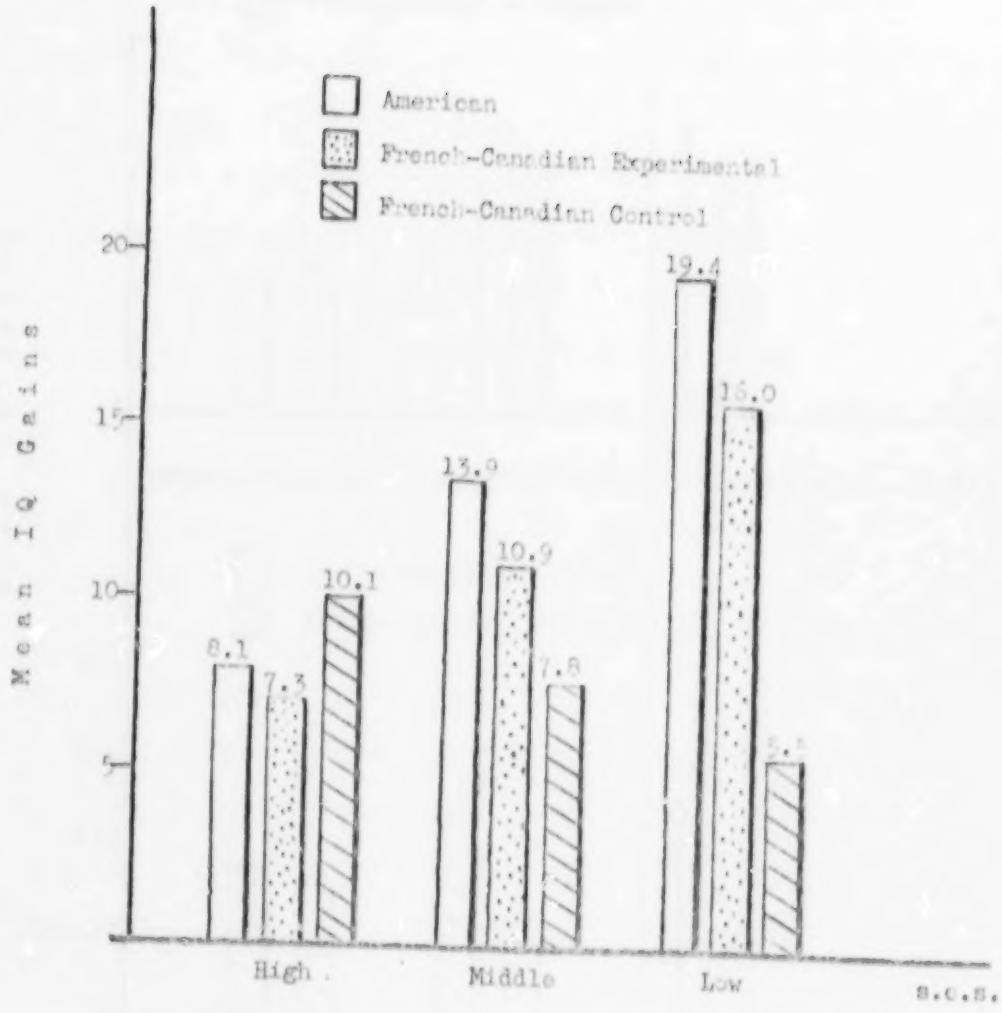

FIGURE 1

MEAN IQ GAINS FOR THE THREE GROUPS
BEFORE PAIRING

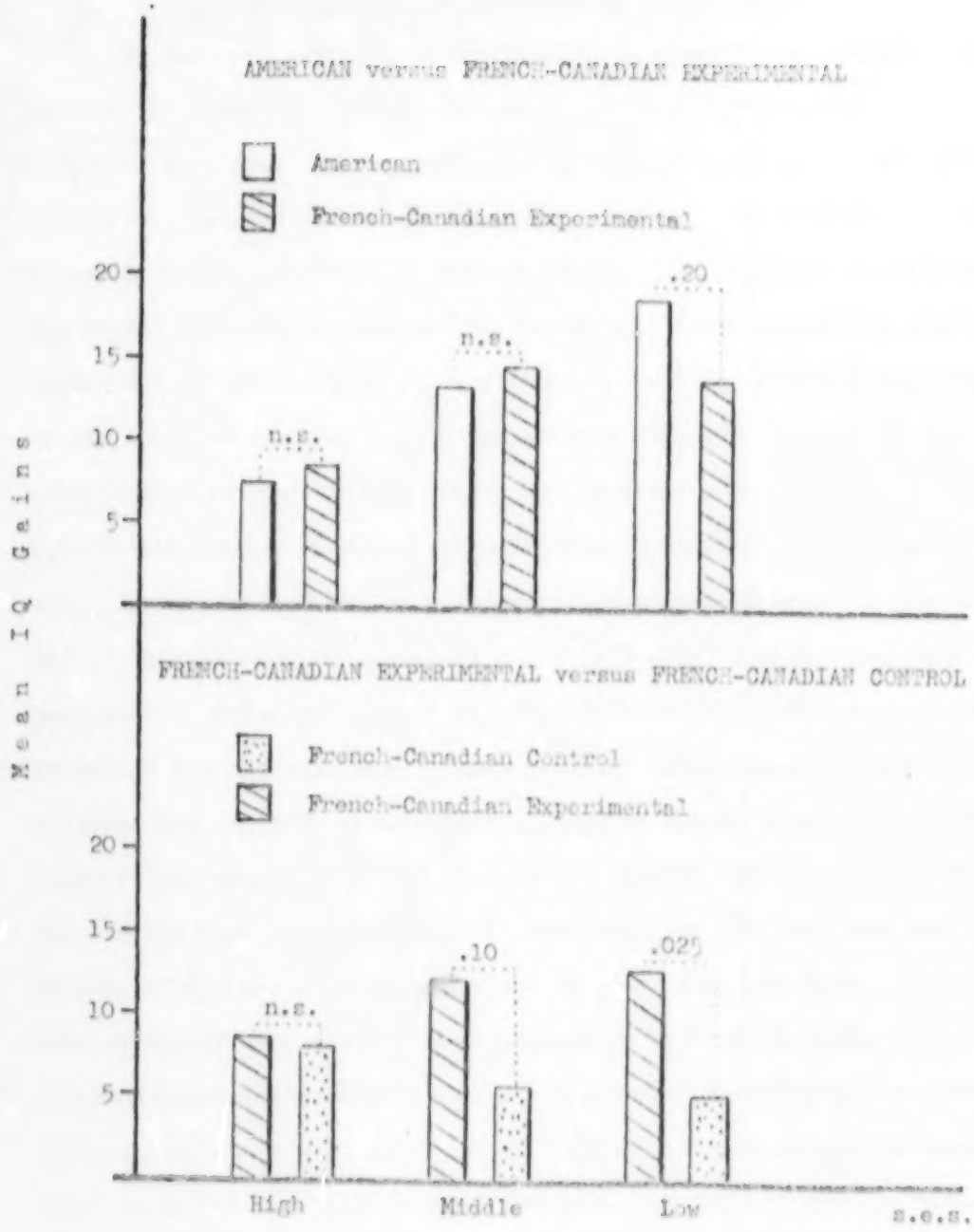

FIGURE 2

COMPARISONS OF AMERICAN VS F.C.E. AND F.C.E. VS F.C.C.
WITH SIGNIFICANCE LEVELS FOR EACH OF THE COMPARISONS
AFTER PAIRING

Correlations Between Initial IQ's and Independent Variables

In the next section, it was desired to present the correlations between the dependent variable IQ gains, and each of the independent variables sex, age, socioeconomic status, father's education, mother's education, family size, and birth order. However, the meaning of these correlations is questionable, because many of the variables considered are correlated with initial scores, which are highly negatively correlated with IQ gains, as previously shown (r= -.70). Consequently, many of the correlations that were computed were affected strongly by the relationship between initial scores and IQ gains. For example, the correlation between mother's education and IQ gains for the F.C.E. middle s.e.s. group was -.63, which is significant at the 1% level of significance. A high negative correlation for this relationship seems very unreasonable. One might expect that the children of mothers who have higher education levels would tend to gain more from kindergarten. However, these children did not gain as much because they were more prepared when they entered kindergarten, and did not receive as much help as the children who started with less preparation. This explains the high negative correlation between mother's education and IQ gains for this group. Because of this strong effect, most of the correlations between IQ gains, and the independent variables listed above, are somewhat misleading. Therefore, these correlations will not be given. However, the correlations between these variables and initial IQ's have been computed and seem to be meaningful, and are presented below.

When the groups are studied separately and divided into socioeconomic classes, evidence of significant relationships are found between

TABLE XVII

CORRELATIONS BETWEEN INITIAL IQ'S AND INDEPENDENT VARIABLES
SEX, AGE, FATHER'S AND MOTHER'S EDUCATION, FAMILY SIZE, AND BIRTH ORDER

Independent Variables	AMERICAN				FRENCH-CANADIAN EXPERIMENTAL				FRENCH-CANADIAN CONTROL			
	High	Middle	Low	Whole Group	High	Middle	Low	Whole Group	High	Middle	Low	Whole Group
Sex	-.15	-.63***	-.07	-.29**	.04	.23	.11	.15	.08	-.57***	.30	-.005
Age	.44**	.25	-.11	.13	.09	-.05	-.11	.001	.27	.54***	.11	.28**
S.e.s.	-.21	.09	.35*	.42***	.12	.25	.39*	.33***	-.25	.31	.14	.07
Father's Educ.	-.17	.09	.68***	.50***	-.03	.53***	.04	.33***	-.38*	.31	.17	.05
Mother's Educ.	.25	.05	.41**	.47***	-.38*	.70***	-.009	.20*	.26	.12	.25	.22*
Family Size	.05	-.09	-.25	-.06	-.04	-.77***	.12	-.27**	-.43**	-.28	-.02	-.24*
Birth Order	.01	-.08	-.24	-.08	-.03	-.71***	.16	-.22*	-.44**	-.26	.02	-.22*

*** significant at .01 level
** significant at .02 and .05 levels
* significant at .10 level

initial IQ's and some of the independent variables listed above. Of interest are the following significant correlations: sex: -.63 and -.57 for American and F.C.C. middle s.e.s., where the code used was 1 for boys and 2 for girls; age: .44 and .54 for American high s.e.s., and F.C.C. middle s.e.s.; father's education: .68 for American low s.e.s., .53 for F.C.E. middle s.e.s., and -.38 for F.C.C. high s.e.s.; mother's education: .41 for American low s.e.s., -.38 and .70 for high and middle F.C.E.; family size: -.77 for F.C.E. middle, and -.43 for F.C.C. high s.e.s.; birth order: -.71 for F.C.E. middle, and -.44 for F.C.C. high s.e.s.

When the socioeconomic status divisions are set aside, and each group is considered as a whole, the correlation between independent variable mother's education and initial IQ is significant for each group: .47 for the American, .20 for the F.C.E., and .22 for the F.C.C. The variable father's education presents two significant positive relationships of .50 and .33 for American and F.C.E. groups respectively. The correlations between socioeconomic status and initial IQ's is highly significant for the American and F.C.E. groups, .62 and .33, but has no significance whatsoever, for the F.C.C. group. The variables family size and birth order present some significant negative correlations only for French-Canadian groups; family size: -.27 and -.24; birth order: -.22 for both groups.

Unfortunately, there is range restriction for some of the independent variables. When correlations for each of the three groups are computed for the socioeconomic subclasses, there is likely to be range restriction for many independent variables since the ranges are often smaller in the subclasses than for the whole group. These range

restrictions can limit the precision of the correlations. For example, for the middle s.e.s. subclass of the American group the correlation between mother's education and initial IQ is only .05, although the correlation between mother's education and initial scores for the whole American group is .47. But the range for mother's education for the middle s.e.s. subclass is only 2 (11-13), whereas the range for the whole group is 19 (3-22).

In some instances range restriction is also a problem for the correlations computed for the groups as a whole (i.e. ignoring the s.e.s. subclasses). For example, the correlation between father's education and initial scores for the F.C.C. group is only .05; the same correlation for the American group is .50. The father's educations for the F.C.C. group range from 5-18 years, with 37 of the 57 cases falling between 7 to 10 years. For the American group, the father's educations range between 7 and 22 years with no severe clustering in any small range. Therefore, the nonsignificance of the F.C.C. correlation is likely due to range restriction.

In conclusion, for some of the variables only the correlations taken for the whole groups are indicative of the actual relationship, because of range restriction limitations placed on the subclass correlations. However, for some variables (e.g. sex, age, family size, and birth order), range restrictions may even affect some of the correlations computed for the whole groups.

As pairing the observations has eliminated some bias due to the effects of initial IQ's on the IQ gains, likewise, computing the correlations between each of the seven independent variables and initial IQ's (rather than IQ gains) makes the correlations meaningful. This is because

these correlations are most affected by the strong relationship between initial scores and IQ gains as are the correlations between the seven independent variables and IQ gains. Furthermore, range restriction explained the limitations placed on some of the subclass correlations, and also some of the correlations computed for the whole groups.

CHAPTER IV

SUMMARY AND CONCLUSIONS

The Peabody Picture Vocabulary Test was administered, at the beginning and end of the school year 1965-1966, to 113 five-year-old children who had spent a year in kindergarten, and 57 otherwise comparable children who had not. These children represented upper, middle, and lower socio-economic levels of two cultures, the American and the French-Canadian. The primary purpose of the first part of this research was an attempt to measure the effect of kindergarten experience on the child's vocabulary. The effects would be determined by the IQ gains made on the PPVT.

In addition, a search of some relationships held between the dependent variable, the IQ gain on the PPVT, and independent variables sex, age, socioeconomic status, father's and mother's education, number of children in the family, and birth order, constituted the second part of this study.

Thus, this research has a twofold purpose:

1. to determine the effect of kindergarten experience on the five-year-old's vocabulary;
2. to attempt to find out what, if any, relationships held between the dependent variable, IQ gains, as measured by a standardized test (the PPVT), and independent variables sex, age, socioeconomic status, father's and mother's education, number of children in the family, and birth order.

This study was successful in determining the benefits of kinder-

gartenors over non-kindergarteners as far as vocabulary is concerned. However, because of the high negative correlation found between initial IQ and IQ gain, it was not feasible to establish what relationships held between IQ gains and the seven independent variables. Nevertheless, the correlations between each of the seven variables and initial IQ's were of interest and were therefore computed.

Effects of Kindergarten Experience on the Child's Vocabulary

Until recently, differences in children's IQ were attributed largely to native ability; very little of the variation was attributed to the effects of environment. Bloom, and his collaborators, Davis and Hess have demonstrated that "for children growing up under adverse circumstances the IQ may be depressed by a significant amount and that intervention at certain point (and especially in the period from ages three to nine) can raise the IQ by as much as ten to fifteen points. Such effects have been most clearly demonstrated for children with initial IQ's of less than 110. While there is nothing sacred about the IQ, these researchers continue, it has been a useful indicator of general learning capability in the schools. A change in IQ is symptomatic of a change in general learning capability and this is likely to be verified by more direct measures of school learning" (8).

The measurement of IQ gains which have occured during the kindergarten year, and are most likely due to this experience, was the major purpose of this study. These thesis data show that after the kindergarten year, the experimental groups, American and F.C.E., were significantly higher than the control, F.C.C., in IQ gains. The mean IQ gain is 12.6 points for experimental groups, and 7.8 points for the control group.

For the groups considered separately, it is 13.8 points for the American group, 11.4 points for the F.C.E. group, and 7.6 points for the F.C.C. group. When the socioeconomic subclasses are taken into account, the IQ gains take the following direction: for both experimental groups, the lower the s.e.s., the higher the gains. That is, the lower s.e.s. groups seem to gain more from kindergarten than the higher s.e.s. groups. On the other hand, for the control group, the higher the s.e.s., the higher the gains. That is, of children who did not have the benefit of kindergarten, those who were in more favorable environmental conditions gained more. Figure 1, (p. 47) indicates the direction of IQ gains for the three groups.

Upon comparing experimental and control groups, it was observed that F.C.E. and F.C.C. high s.e.s. groups show no-significant difference between their IQ gains. Therefore, for at least the region from which the sample was taken, kindergarten is apparently of no help for the high s.e.s. children in improving IQ as measured by the PPVT. That is, high s.e.s. children seem to gain as much form their environment as they do from kindergarten. However, the difference between the middle s.e.s. groups is significant at the .10 level, while the comparisons for the low s.e.s. groups indicate a discrepancy which is significant at .025. That is, kindergarten seems to help the low s.e.s children more than the others. This is because the low s.e.s. children, in general, have lower initial IQ's, and kindergarten is therefore more helpful to these children.

As for the experimental groups, the American and F.C.E., the comparisons in Figure 2 (p. 48) indicate a significant difference (.20 level) for only the low s.e.s. group. It appears that the high and middle s.e.s. experimental groups are not different in IQ gains in spite of the

dissimilarity of culture, and the newness of kindergarten education for the French-Canadian group. As far as the low s.e.s. experimental groups are concerned, their difference might be explained by the fact that the low American group came from a school which is part of the current United States "war against poverty". This school has a preschool Head Start program, and it may be that the staff in general is teaching more effectively because of their committment to the idea of "Head Start".

In accordance with Streitbeck's and Smilansky's findings in studies of culturally-deprived children, our data substantiate the hypothesis that the lower the initial IQ of the child, the greater the gains over the year. A high negative correlation of -.70 found in the current study supports this thesis.

The great discrepancy between the mean IQ gains of the kindergarten low s.e.s. (17.7 points), and the non-kindergarten low s.e.s. (5.5 points) is probably explained by the kindergarten attendance during which the children were exposed to a richer environment as far as vocabulary is concerned. Therefore, children from low social class should be provided with opportunity to attend kindergarten.

Correlations Between Initial IQ's and Independent Variables

Many of the correlations, computed either for subclasses or for whole groups, are of interest and worthy of mention. The most significant relationship seems to be between mother's education, and initial IQ's. A correlation of .47 (significant at .01 level) for the American group, .20 and .22 (significant at .10 level) for both Canadian groups. A very high correlation of .70 (significant at .01 level) for the F.C.E. middle s.e.s., and of .47 (significant at .02 level) for American low s.e.s. are

also worth mentioning. As has been established in previous studies (Tyler), this strong relationship is probably due to the closeness of a mother to her children.

Father's education has the second highest correlations of .50 (significant at .01 level) for the American group, .33 (significant at .01 level) for the F.C.E. Thus, father's education seems to have much influence on children's IQ's but not as much as the mother's education. It is rather curious that there is no significant correlation whatsoever between father's education and initial IQ's for the F.C.C. group.

The influence of s.e.s. on intelligence test scores has been recognized by almost all researchers. We were interested in the effects of s.e.s. on initial IQ's, and therefore originally divided our sample in upper, middle and lower socioeconomic groups. Significant correlations of .42 (significant at .01 level), and .33 (significant at .01 level) were found for American and F.C.E. groups respectively. No significant correlation held for the F.C.C. whatsoever (as was noted earlier, the non-significance of the correlations for the F.C.C. groups is probably due to range restriction).

One is accustomed to seeing data in which family size and lower s.e.s. are confounded. We were, of course, interested to learn whether family size was related to a gain in IQ during the kindergarten year of experience. Canadian groups only have significant negative correlations of -.27 (significant at .02 level) and -.24 (significant at .10 level). A very high negative correlation of -.77 (significant at .01 level) for the F.C.E. middle s.e.s., and of .42 (significant at .02 level) for F.C.C. high s.e.s. are also worth mentioning. This seems to indicate that the more children there are in the family, the less the exposure to adults,

and therefore the lower the children's vocabulary scores.

Significant negative correlations between birth order and initial IQ's were found for Canadian groups only: -.22 (significant at .10 level) for both groups. This is perhaps due to the fact that first born children usually get more attention from parents.

The combination of the independent variables sex and age with initial IQ's did not yield many significant correlations for the total groups. One significant relationship was between sex and initial IQ's for American -.29 (significant at .02 level). Since the code for boys is lower than the code for girls (boys designated by 1 and girls by 2), this negative correlation suggests that, on the average, boys scored higher. In most of the comparisons that have been made on vocabulary, the sex groups have turned out not to differ significantly. The author has no explanation for this apparent inconsistency for the American group. Only one of the groups, F.C.C., showed a significant relationship between age and initial IQ's. However, range restriction has certainly affected the size of these correlations.

Conclusions

Analysis of data yielded the following results:

1. Findings substantiate the hypothesis that the kindergarten groups, disregarding social class, had a higher mean IQ gain than the non kindergarten group. A mean IQ of 12.4 points for the kindergarten groups, and of 6.3 points for the non-kindergarten group support this hypothesis. After the kindergarten year, experimental groups were significantly higher than the control on the PPVT.

2. A discernible difference of 10.0 points supports the second hypothesis: when social class was taken into consideration, the low s.e.s. kindergarten groups' mean IQ gain (17.7) was higher than the high s.e.s. kindergarten groups' (7.7).

3. A t-value of -0.25 indicates a non-significant difference between the high s.e.s. American and F.C.E. groups, and substantiates the following hypothesis: the American and the F.C.E. high s.e.s. groups' IQ gains were not different.

4. A t-value of 2.24, which is significant at the .025 level of significance, supports the fourth hypothesis: the low s.e.s. kindergarten groups' IQ gains were higher than the low s.e.s. non-kindergarten groups' gains.

5. The analysis revealed a mean IQ gain of 5.0 points, for the low s.e.s. non-kindergarteners, which does not substantiate the following hypothesis: the low s.e.s. non-kindergarteners showed a loss of IQ points instead of a gain.

6. The sixth hypothesis reads: there will be a high positive correlation between the size of the family and the children's IQ gains. As has been said previously, the relationship between the seven independent variables and IQ gains, have not been investigated because of the high negative correlation between initial IQ and IQ gain. Therefore, correlations have been computed with initial IQ's. These correlations will be mentioned. Relatively high negative correlations of -.27 and -.24 (significant at the .02 level) for both experimental and control Canadian groups respectively. Also, a very high negative correlation of -.77 (significant at .01 level) for middle F.C.E., and of -.43 (significant at .02 level) for the high F.C.C. group.

7. The last hypothesis can be read thus: there will be no correlation between birth order and IQ gain. Again, the same problem as for the hypothesis number 6 should be kept in mind. Significant negative correlation of -.22 for both Canadian groups, and highly significant negative correlations of -.71 (significant at .01 level), and -.44 (significant at .02 level) for F.C.E. middle s.e.s., and F.C.C. high s.e.s. were found.

This research leads us to conclude that children who have attended kindergarten have advantage in IQ gains, as measured by the PPVT, over those children who have not had such experience. Furthermore, it substantiates the findings that kindergarten is of greater help to children from lower socioeconomic classes, whereas, children from upper classes enter kindergarten with higher IQ's, and therefore improve less than their lower level classmates. Finally, these thesis data support the finding that there is little or no cultural difference between kindergarten American and French-Canadian children, as far as vocabulary is concerned, as measured by the PPVT. It must be kept in mind that the sole measure used was that of size of vocabulary. Vocabulary improvement is, by no means, the only benefit that might accrue to children from attending kindergarten.

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APPENDIX A

1. Child's first name Second name Age: Years Months

   Birth Date:

2. Father's name Address: Tel.:

3. Father's Job: (be precise) Example: - Manager of P & C food market
   - School teacher (specify level such as Elementary, Junior H.S.)
   - Sales clerk at Montgomery Ward

   Father's Job: _____

4. Father's Education: (Circle the numbers representing years completed in each).

   Elementary and Grammar School: 1 2 3 4 5 6 7
   Junior and Senior High School: 8 9 10 11 12
   Trade and Technical School: 1 2 3 4
   College: 1 2 3 4
   Master's: 1 2 3 4
   Ph.D.: 1 2 3 4
   Any other (specify): _____

5. Mother's Education:

   Elementary and Grammar School: 1 2 3 4 5 6 7
   Junior and Senior High School: 8 9 10 11 12
   Practical Nurse Training: 1
   Hospital Training course for Registered Nurses: 1 2 3
   Business, Trade, or Technical School: 1 2 3 4
   College: 1 2 3 4
   Master's: 1 2 3 4
   Ph. D.: 1 2 3 4
   Any other (specify): _____

6. How many brothers and sisters has this child? _____

7. This child was born: 1st 2nd 3th 4th 5th 6th 7th 8th 9th 10th in the family?

8. What language(s) is (are) spoken at home?

   English _____

   Other(s): specify _____

   Both English and another language___

APPENDIX B

PPVT RESULTS FOR AMERICAN GROUP

	RAW SCORES			IQ		
	1st	2nd	Difference	1st	2nd	Difference
101	57	61	4	114	112	- 2
102	58	69	11	116	130	14
103	63	69	6	117	130	13
104	61	65	4	121	121	-
105	68	67	- 1	127	125	- 2
106	50	63	13	101	117	16
107	62	66	4	123	123	-
108	56	68	12	112	127	15
109	64	64	-	119	119	-
110	66	68	2	123	127	4
111	64	65	1	119	121	2
112	51	64	13	103	119	16
113	59	66	7	117	123	6
114	49	63	14	99	117	18
115	62	66	4	115	123	8
116	54	65	11	103	121	13
117	56	65	9	112	121	9
120	57	69	12	114	130	16
121	49	65	16	99	121	22
122	57	64	7	104	119	15
123	58	62	4	106	115	9
124	41	56	15	84	102	18
125	52	59	7	104	108	4
126	56	58	2	102	106	4
127	48	63	15	97	117	20
128	65	77	12	129	145	16
129	53	66	13	95	123	28
130	48	62	14	97	115	18
131	64	65	1	119	121	2

	RAW SCORES			IQ		
	1st	2nd	Difference	1st	2nd	Difference
132	58	64	6	106	119	13
133	50	68	18	101	127	26
134	47	57	10	82	104	22
135	64	69	5	119	130	11
136	63	67	4	117	125	8
137	58	65	7	106	121	15
138	57	63	6	114	117	3
139	58	64	6	106	119	13
140	47	58	11	95	106	11
143	43	54	11	88	97	9
144	58	69	11	116	130	14
145	53	68	15	95	127	32
146	45	59	14	91	108	17
147	44	62	18	90	115	25
148	55	69	14	110	130	20
150	61	66	5	112	123	11
151	57	69	12	104	130	26
152	46	63	17	80	117	37
153	50	65	15	101	121	20
154	62	70	8	123	132	9
155	58	67	9	106	125	19
156	57	67	10	104	125	21
157	48	65	17	97	121	24
159	62	68	6	123	127	4
160	49	65	16	99	121	22

PPVT RESULTS FOR FRENCH CANADIAN EXPERIMENTAL GROUP

	RAW SCORES			IQ		
	1st	2nd	Difference	1st	2nd	Difference
200	65	66	1	129	123	- 6
201	53	64	11	106	119	13
202	68	71	3	127	134	7
203	69	72	3	130	138	8
204	63	69	6	125	130	5
205	59	63	4	117	117	-
206	63	67	4	117	112	- 5
207	61	66	5	121	123	2
208	56	61	5	112	112	-
209	53	67	14	95	125	30
210	75	73	- 2	142	138	- 4
211	38	62	24	78	115	37
212	67	72	5	125	122	- 3
213	64	68	4	127	127	-
214	65	71	6	121	134	13
215	71	70	- 1	134	118	-16
216	70	72	2	132	136	4
217	49	65	16	87	108	21
218	65	71	6	129	134	5
219	65	68	3	121	127	6
220	47	70	23	95	132	37
221	73	75	2	138	142	4
222	72	74	2	142	140	- 2
223	65	68	3	129	127	- 2
224	61	69	8	121	130	9
225	50	63	13	89	104	15
226	47	65	18	82	121	39
227	67	72	5	125	122	- 3
228	59	69	10	108	116	8

	RAW SCORES			IQ		
	1st	2nd	Difference	1st	2nd	Difference
230	68	74	6	127	140	13
231	63	72	9	123	136	11
232	45	59	14	91	108	17
234	50	66	16	89	110	21
235	54	74	20	97	140	43
237	59	66	7	117	123	6
238	52	62	10	93	115	22
239	68	73	5	127	124	- 3
240	68	68	-	127	127	-
241	71	75	4	134	142	8
242	66	73	7	123	124	1
244	62	72	10	123	136	13
245	58	64	6	116	119	3
246	50	58	8	101	106	5
247	43	59	16	88	108	20
248	46	53	7	93	95	2
249	49	62	13	87	114	27
250	67	66	- 1	125	123	- 2
251	62	66	4	115	110	- 5
252	69	70	1	130	132	2
253	52	58	6	104	106	2
254	46	67	21	80	112	32
255	64	72	8	127	136	9
256	60	64	4	119	119	-
257	60	59	- 1	110	108	- 2
258	52	71	19	93	134	41
259	48	62	14	85	115	30
260	42	64	22	86	119	33
262	42	68	26	86	127	41
263	46	70	24	80	132	52

PPVT RESULTS FOR FRENCH CANADIAN CONTROL GROUP

	RAW SCORES			IQ		
	1st	2nd	Difference	1st	2nd	Difference
301	69	69	-	130	130	-
302	64	71	7	127	134	7
303	54	62	8	108	115	7
304	60	65	5	119	121	2
305	47	50	3	95	89	- 6
306	27	53	26	58	95	37
307	53	[illegible]	9	103	115	9
308	58	68	10	116	127	11
309	48	61	13	97	112	15
310	53	64	11	106	119	13
311	58	62	4	116	115	- 1
312	55	60	5	110	110	-
313	62	65	3	115	121	6
314	65	66	1	121	123	2
315	63	74	11	119	140	21
316	70	72	2	138	136	- 2
317	45	71	26	91	134	43
318	53	66	13	106	123	17
320	67	69	2	125	130	5
321	66	67	1	123	125	2
322	72	67	- 5	136	125	-11
323	65	70	5	129	132	3
324	55	60	5	100	110	10
325	48	60	12	97	110	13
326	38	54	16	78	97	19
327	62	63	1	123	117	- 6
329	58	67	9	106	125	19
330	43	50	7	88	89	1
331	45	58	13	91	106	15

	RAW SCORES			IQ		
	1st	2nd	Difference	1st	2nd	Difference
332	40	54	14	82	97	15
333	63	68	5	125	127	2
334	45	60	15	91	110	19
335	54	58	4	97	106	9
336	48	53	5	97	95	- 2
337	53	64	11	106	119	13
338	63	70	7	117	132	15
339	42	52	10	86	93	7
340	59	60	1	103	110	2
341	61	62	1	121	115	- 6
342	46	57	11	93	104	11
343	20	43	23	45	74	29
344	36	58	22	75	106	31
345	67	68	1	125	127	2
346	58	60	2	116	110	- 6
347	63	65	2	125	121	- 4
348	61	68	7	121	127	6
349	56	62	6	112	115	3
350	63	67	4	117	125	8
351	60	64	4	119	119	-
352	59	56	- 3	106	102	- 6
354	45	50	5	91	89	- 2
355	60	64	4	119	119	-
356	44	62	18	76	115	39
357	59	54	- 5	108	97	-11
358	63	72	9	125	136	11
359	47	48	1	95	85	-10
360	55	65	10	110	121	11

APPENDIX C

PAIRED OBSERVATIONS
FOR FRENCH-CANADIAN EXPERIMENTAL AND FRENCH-CANADIAN CONTROL
HIGH SOCIOECONOMIC STATUS

It should be noted that in order to use the t-test one must assume that the differences in IQ gains (i.e. the d_i's) are normally distributed. The validity of this assumption is discussed in the Findings Chapter.

N=14

Pairs	IQ Gains F.C.E.	IQ Gains F.C.C.	d_i
1	-16	- 2	-14
2	8	0	8
3	7	7	0
4	5	2	3
5	13	21	- 8
6	6	2	4
7	2	11	- 9
8	0	- 1	1
9	- 5	6	-11
10	0	0	0
11	13	17	- 4
12	30	15	15
13	37	- 6	43
14	21	43	-22

$H_o : \mu_1 = \mu_2$ or $H_o : \mu_d = 0$

$H_a : \mu_1 > \mu_2$ $H_a : \mu_d > 0$

$\Sigma d_i = 6.0$

$\bar{d} = 0.42$

$s_d = 15.5$

(A one-sided test was chosen on all Experimental versus Control comparisons because the assumption was made that the control group could not have a higher average gain than the experimental group).

$$s_d : \sqrt{\frac{\Sigma d_i^2 - \frac{\Sigma d_i^2}{n}}{n-1}}$$

$$: \sqrt{\frac{3126 - \frac{36}{14}}{13}} = \sqrt{\frac{3126 - 2.57}{13}} = \sqrt{\frac{3123.43}{13}} = \sqrt{240.26} = 15.5$$

t statistic : $\dfrac{\bar{d}}{s_d / \sqrt{n}}$

$$: \frac{.42}{\frac{15.5}{\sqrt{14.0}}} = \frac{.42}{\frac{15.5}{3.74}} = \frac{.42}{4.14} = .101$$

PAIRED OBSERVATIONS
FOR FRENCH-CANADIAN EXPERIMENTAL AND FRENCH-CANADIAN CONTROL
MIDDLE SOCIOECONOMIC STATUS

N=14	Pairs	IQ Gains F.C.E.	IQ Gains F.C.C.	d_i
	1	8	-11	19
	2	- 2	3	- 5
	3	-	5	- 5
	4	- 3	2	- 5
	5	- 3	- 6	3
	6	1	2	- 1
	7	6	15	- 9
	8	8	13	- 5
	9	43	13	30
	10	22	9	13
	11	17	19	- 2
	12	15	15	0
	13	21	1	20
	14	39	15	24

H_o : $\mu_1 - \mu_2$ or H_o : $\mu_d = 0$ $\quad \Sigma d_i = 77.0$

H_a : $\mu_1 > \mu_2$ $\quad H_a$: $\mu_d > 0$ $\quad \bar{d} = 5.5$

$s_i = 12.94$

$$s_d : \sqrt{\frac{\Sigma d_i^2 - \frac{(\Sigma d_i)^2}{n}}{n-1}}$$

$$: \sqrt{\frac{2601 - \frac{5929}{14}}{13}} = \sqrt{\frac{2601 - 423.5}{13}} = \sqrt{\frac{2177.5}{13}} = \sqrt{167.5} = 12.94$$

t statistic : $\dfrac{\bar{d}}{s_d / \sqrt{n}}$

$$: \frac{5.50}{\frac{12.94}{\sqrt{14}}} = \frac{5.50}{\frac{12.94}{3.74}} = \frac{5.50}{3.74} = 1.58$$

$t_{.95,\ 13\ df}$: 1.77

$t_{.90,\ 13\ df}$: 1.35

This t value, 1.58, is significant at the .10 level of significance.

PAIRED OBSERVATIONS
FOR FRENCH-CANADIAN EXPERIMENTAL AND FRENCH-CANADIAN CONTROL
LOW SOCIOECONOMIC STATUS

N=16	Pairs	IQ Gains F.C.E.	IQ Gains F.C.C.	d_i
	1	2	- 4	6
	2	9	2	7
	3	- 2	11	-13
	4	13	- 6	19
	5	-	6	- 6
	6	3	8	- 5
	7	- 5	- 6	1
	8	- 2	11	-13
	9	2	-11	1[illegible]
	10	5	- 6	1[illegible]
	11	2	-10	1[illegible]
	12	41	11	30
	13	20	- 2	22
	14	33	7	26
	15	32	39	- 7
	16	52	31	21

$H_o : \mu_1 = \mu_2$ or $H_o : \mu_d = 0$ $\quad \Sigma d_i = 124.0$

$H_a : \mu_1 > \mu_2$ $\quad H_a : \mu_d > 0$ $\quad \bar{d} = 7.75$

$s_d = 13.82$

$$s_d : \sqrt{\frac{\Sigma d_i^2 - \frac{\Sigma d_i^2}{n}}{n-1}}$$

$$: \sqrt{\frac{3829 - \frac{15376}{16}}{15}} = \sqrt{\frac{3829 - 961}{15}} = \sqrt{\frac{2868}{15}} = \sqrt{191.2} = 13.82$$

t statistic : $\dfrac{\bar{d}}{s_d / \sqrt{n}}$

$$: \frac{7.75}{\frac{13.82}{\sqrt{16}}} = \frac{7.75}{\frac{13.82}{4}} = \frac{7.75}{3.455} = 2.24$$

$t_{.975,\ 15\ df}$: 2.13

$t_{.99\ ,\ 15\ df}$: 2.6

[illegible]

PAIRED OBSERVATIONS
FOR AMERICAN AND FRENCH-CANADIAN EXPERIMENTAL
HIGH SOCIOECONOMIC STATUS

N=12	Pairs	IQ Gains AMERICAN	IQ Gains F.C.E.	d_i
	1	- 2	=	- 2
	2	=	5	- 5
	3	4	- 3	7
	4	=	2	- 2
	5	=	13	-13
	6	2	6	- 4
	7	6	=	6
	8	13	- 5	18
	9	15	=	15
	10	16	13	3
	11	16	37	-21
	12	18	30	-12

$H_o : \mu_1 = \mu_2$ or $H_o : \mu_d = 0$

$H_a : \mu_1 \neq \mu_2$ $H_a : \mu_d \neq 0$

$\Sigma d_i = -10.0$

$\bar{d} = -0.83$

$s_d = 11.43$

$$s_d = \sqrt{\frac{\Sigma d_i^2 - \frac{(\Sigma d_i)^2}{n}}{n-1}}$$

$$= \sqrt{\frac{1446 - \frac{100}{12}}{11}} = \sqrt{\frac{1446 - 8.33}{11}} = \sqrt{\frac{1437.27}{11}} = \sqrt{130.66} = 11.43$$

$$\text{t statistic} = \frac{\bar{d}}{s_d / \sqrt{n}}$$

$$= \frac{-0.83}{\frac{11.43}{\sqrt{12}}} = \frac{-0.83}{\frac{11.43}{3.46}} = \frac{-0.83}{3.30} = -0.25$$

This t value, -0.25, is not significant at any reasonable level of significance.

PAIRED OBSERVATIONS
FOR AMERICAN AND FRENCH-CANADIAN EXPERIMENTAL
MIDDLE SOCIOECONOMIC STATUS

N=12	Pairs	IQ Gains AMERICAN	IQ Gains F.C.E.	d_i
	1	6	- 2	8
	2	2	- 3	5
	3	11	1	10
	4	8	9	- 1
	5	3	6	- 3
	6	13	8	5
	7	13	43	-30
	8	18	22	- 4
	9	11	17	- 6
	10	28	15	13
	11	18	21	- 3
	12	22	39	-17

$H_o : \mu_1 = \mu_2$ or $H_o : \mu_d = 0$

$H_a : \mu_1 \neq \mu_2$ $H_a : \mu_d \neq 0$

$\Sigma d_i = -13.0$

$\bar{d} = -1.08$

$s_d = 13.10$

$$s_d : \sqrt{\frac{\Sigma d_i^2 - \frac{\Sigma d_i^2}{n}}{n-1}}$$

$$: \sqrt{\frac{1903 - \frac{169}{12}}{11}} = \sqrt{\frac{1903 - 14.08}{11}} = \sqrt{\frac{1888.92}{11}} = \sqrt{171.72} = 13.10$$

t statistic : $\dfrac{\bar{d}}{s_d / \sqrt{n}}$

$$: \frac{-1.08}{\frac{13.1}{\sqrt{12}}} = \frac{-1.08}{\frac{13.1}{3.46}} = \frac{-1.08}{3.78} = -0.28$$

This t value, -0.28, is not significant any reasonable level of significance.

PAIRED OBSERVATIONS
FOR AMERICAN AND FRENCH-CANADIAN EXPERIMENTAL
LOW SOCIOECONOMIC STATUS

N=13	Pairs	IQ Gains AMERICAN	IQ Gains F.C.E.	d_i
	1	4	- 2	6
	2	9	13	- 4
	3	14	-	14
	4	11	- 5	16
	5	20	- 2	22
	6	21	2	19
	7	20	5	15
	8	24	41	-17
	9	32	2	30
	10	17	20	- 3
	11	25	27	- 2
	12	9	33	-24
	13	37	32	5

$H_o : \mu_1 = \mu_2$ $\quad H_o : \mu_d = 0$ $\quad \Sigma d_i = 77.0$

$H_a : \mu_1 \neq \mu_2$ or $H_a : \mu_d \neq 0$ $\quad \bar{d} = 5.92$

$s_d = 15.59$

$$s_d : \sqrt{\frac{\Sigma d_i^2 - \frac{\Sigma d_i^2}{n}}{n-1}}$$

$$: \sqrt{\frac{3375 - \frac{5929}{13}}{12}} = \sqrt{\frac{3375 - 456.07}{12}} = \sqrt{\frac{2918.93}{12}} = \sqrt{243.24} = 15.59$$

$$\text{t statistic} : \frac{\bar{d}}{s_d / \sqrt{n}}$$

$$: \frac{5.92}{\frac{15.59}{\sqrt{13}}} = \frac{5.92}{\frac{15.59}{3.6}} = \frac{5.92}{4.33} = 1.36$$

$t_{.95,\ 12\ df} : 1.78$

$t_{.90,\ 12\ df} : 1.35$

This t value, 1.36, is significant at the .20 level of significance.

A STUDY OF THE EFFECTS OF KINDERGARTEN EXPERIENCE ON VOCABULARY

Sister Candide Pineault, Ph.D.
Cornell University 1967

STATEMENT OF THE PROBLEM

The purpose of this study is to determine whether five-year-olds who attend kindergarten show significantly greater changes in IQ, as measured by the Peabody Picture Vocabulary Test (1959), than those not attending such a school. Several facets of the research and findings reported in this thesis had, until now, not been treated sufficiently: 1) the present work incorporates a treatment of children of different socioeconomic status and parents' educational backgrounds, 2) it is on a cross-cultural basis, and 3) the testing was by means of the PPVT.

PROCEDURE

The sample consisted of children who came from two different ethnic groups. There were 54 Americans from Ithaca and suburbs, New York, and 116 French-Canadians from Chicoutimi, province of Quebec. The control group, composed of 57 non-kindergarteners, were chosen in Ste-Claire, a suburb of Chicoutimi, where no kindergarten classes were available. Since public kindergarten facilities are available to all children in the Ithaca area, there were no non-kindergarteners to provide a control group for the American children. The three groups were equated for age and socioeconomic status. The age range of the subjects was from 60 to 71 months, with a mean of 64.8 months. On the basis of Blishen's "Occupational Class Scale" three subgroups were established: upper, middle, and lower socioeconomic status. It happened that a ratio of almost one to one, male to female, appeared in the distribution of testees.

The 113 kindergarteners who composed the two experimental groups attended kindergarten during the school year 1965-1966. During this period, the children were exposed to various school activities for two and a half hours daily, five days a week. The control group did not receive any school instruction. This kindergarten experience was the constant to which the two experimental groups were exposed. There was no in-depth study of either the quality of the school for the kindergarteners, or the home environment for the non-kindergarteners. Thus, the results of these tests have as partial bases variables that were not treated in this study. Form B of the PIVT was administered to the 170 subjects at the beginning and the end of the school year; thus, the factor of practice in taking the test twice may be considered insignificant.

RESULTS

This study was successful in determining the benefits of kindergarteners over non-kindergarteners as far as vocabulary is concerned. However, because of the high negative correlation found between initial IQ and IQ gain (r= -70), it was not feasible to establish what relationships held between IQ gains and the seven independent variables. Nevertheless, the correlations between each of the seven variables and initial IQ's were of interest and were therefore computed.

CONCLUSIONS

Findings substantiate the hypothesis that the kindergarten groups, disregarding social class, had a higher mean IQ gain than the non-kindergartener groups.

A second hypothesis was supported: when social class was taken into consideration, the low s.e.s. kindergarten groups' mean IQ gain (17.7) was higher than the high s.e.s. kindergarten groups' (7.7).

A third hypothesis was supported: there were no significant differences between the IQ gains of the American and the F.C.E. high s.e.s. groups.

A fourth hypothesis was substantiated: the low s.e.s. kindergarten groups' IQ gains were higher than the low s.e.s. non-kindergarten groups' gains.

The analysis revealed a mean IQ gain of 5 points, for the low s.e.s. non-kindergarteners, which does not substantiate the hypothesis that the low s.e.s. non-kindergarteners would show a loss of IQ points instead of a gain.

The sixth hypothesis read: there will be a high positive correlation between the size of the family and the children's IQ gains. However, negative correlations for the Canadians, and non-significant correlations for Americans did not support this hypothesis.

The last hypothesis was that there would be no correlation between birth order and IQ gain. This seemed to be confirmed by the American group, but highly significant correlations were found for the Canadian group:first-born made greater gains.

This research leads us to conclude that children who have attended kindergarten have advantage in IQ gains, as measured by the PPVT, over those children who have not had such experience. Furthermore, it substantiates the findings that kindergarten is of greater help to children from lower socioeconomic classes, whereas, children from upper classes enter kindergarten with higher IQ's and therefore improve less than their lower level classmates. Finally, the data support the finding that there is little or no cultural difference between kindergarten American and French-Canadian children, as far as vocabulary is concerned. However, it must be kept in mind that vocabulary improvement is, by no means, the only benefit that might accrue to children from attending kindergarten.